Gulf Research Reports, Vol. 5, No. 2, 17–28

BIOLOGY AND DISTRIBUTION OF THE MACROCOELENTERATES OF MISSISSIPPI SOUND AND ADJACENT WATERS*

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ABSTRACT Studies conducted in Mississippi Sound from April 1971 through June 1973 elucidated the seasonal and areal distribution of seven species of macrocoelenterates: *Aurelia aurita* (L), *Chrysaora quinquecirrha* (Desor 1848), *Pelagia noctiluca* Forskål 1775, *Chiropsalmus quadrumanus* (Müller 1859), *Rhopilema verrillii* (Fewkes 1887), *Stomolophus meleagris* L. Agassiz 1862, and *Physalia physalis* (L). Physical parameters presumed relevant to the distribution of each of these animals are presented. Developmental histories of certain of these forms are described.

INTRODUCTION

Although there are no recorded instances of dire human encounters with coelenterates along the northern coast of the Gulf of Mexico, the imminent development of the offshore barrier islands as National Park playgrounds introduced the eventuality of human encounters with potentially virulent medusae. Such prospects prompted an intensive investigation of the seasonal and areal distribution of the several large species of jellyfishes presumed inimical toward man's recreational or commercial activities along the northern Gulf coast.

Few studies have been made concerning the biology or distribution of any of the several species of large virulent medusae common to the northern coast of the Gulf of Mexico. The first accounts of scyphozoan medusae collected within the Gulf of Mexico were recorded by Mayer (1900), and Mayer (1910). Hedgpeth (1954) essentially reiterates Mayer's findings and notes the occurrence of two species of scyphomedusae unknown to the earlier author. Whitten et al. (1950) noted the occurrence of three species of Scyphozoa off the Texas coast. Similarly, Gunter (1950) and Simmons (1957) listed a few species of scyphozoan medusae from the waters of Texas. Hoese et al. (1964) provided data concerning the periodic occurrence of *Cyanea capillata versicolor* at Port Aransas, Texas. Guest (1959) and Phillips and Burke (1970) treated the presence of cubomedusae in the waters of Texas and Mississippi, respectively. Burke (1975) noted the occurrence of ten species of Scyphozoa in Mississippi waters.

Sanders and Sanders (1963) in proposing a new subspecies of *Pelagia noctiluca* provided pertinent morphometrics on this oceanic medusa which is, under certain weather conditions, fairly common along the northern Gulf coast. Menzel (1971) in a third edition checklist related the occurrence of five species of scyphozoan medusae and the siphonophore *Physalia physalis* in the waters of Apalachee Bay and St. George Sound, Florida. Christmas (1973) discussed three species of scyphomedusae known to occur within Mississippi Sound. Phillips et al. (1969) elaborated on the ecological role of certain species of Mississippi medusae, and felt that the trophic impact of some of the larger forms must be considerable.

*This study was conducted in cooperation with the Department of Commerce, NOAA, National Marine Fisheries Service, under Public Law 89-720, Project No. JF-2-8.

AREA DESCRIPTION

Mississippi Sound is a shallow, elongate body of water, extending from Lake Borgne, Louisiana on the west, to Mobile Bay, Alabama on the east. It is bounded to the south by a series of five low, sand barrier islands. Six passes, three of which are maintained for purposes of navigation, connect the Sound with the open Gulf of Mexico. Coastal sections of three states, Louisiana, Mississippi and Alabama, constitute the northern boundary of the Sound. Fresh water drains into Mississippi Sound via four major watersheds: the Pearl River drainage, St. Louis and Biloxi Bays, and the East and West Pascagoula Rivers. Further influxes of fresh water are derived from the Lake Pontchartrain-Lake Borgne area and from the Mobile Bay complex.

Since Mississippi Sound is essentially a shallow lagoon traversed by deeper passes and drowned river valleys, vertical, areal and seasonal variations in salinity are occasionally extreme. Further, because of Mississippi Sound's temperate location, shallow discolored waters, seasonally changeable wind patterns and inconstant cycles of river discharge, water temperature represents a variable physical parameter.

The sub-tidal bottoms of Mississippi Sound for the most part are soft, sticky muds. Sandy substrata are found adjacent to the barrier islands to the south, and along the man-made sand beaches of the Mississippi mainland. Solid substrata are scarce and are limited to viable oyster reefs, scattered dead valves, debris and man-made structures.

SAMPLING TECHNIQUES

To determine the macrocoelenterate communities indigenous to the barrier islands of Mississippi Sound, monthly trawling routines along the north and south shores of each island were initiated in April 1971 and terminated in June 1973.

The standard otter trawls utilized for such efforts were 16-ft wide semi-balloons made of 1-inch stretch-mesh nylon. Trawls were dragged at each station for 30 minutes at an approximate speed of 3 knots. All macrocoelenterates collected in trawls were preserved in 5% formalin-seawater solutions and were taken to the laboratory for identification, counts and measurement. Additional coelenterate specimens were frequently collected with dip-nets.

Concurrent with the monthly trawl hauls executed along the shores of each barrier island, visual surveys were conducted by walking and collecting all stranded jellyfish specimens along the mile of shoreline adjacent to the trawling sites. These specimens were preserved and taken to the laboratory where, if decomposition did not preclude identification, measurements and counts were made.

Since earlier sampling programs had indicated that the cnidaria of Mississippi Sound were recruited from the Gulf of Mexico, efforts were made to quantitate the induction of such forms, as larvae, i.e., ephyrae or early postephyrae. Hence monthly samples were taken from the passes between the barrier islands off the Mississippi and Alabama coasts with 12-inch Clarke-Bumpus bottom plankton samplers equipped with 500-micron netting. Monthly hauls at each site were of an hour's duration and in most cases sampled the entire width of the pass. The samples obtained were carefully examined for ephyrae in the field and were maintained live for microscopic examination in the laboratory. Following meticulous examination, all plankton samples were preserved in 10% formalin-seawater and 48-hour settle volumes were determined.

After August 1971, monthly surface and bottom plankton samples and bottom trawl samples were collected from various bays along the mainland to monitor coelenterate production and infestations deep within the estuary.

Sites were selected in St. Louis Bay, Bay of Biloxi, East and West Pascagoula River systems, and Grant's Pass (Pass aux Herons) in Mobile Bay, Alabama. Bottom plankton sampling and bottom trawl sampling were conducted in fashions identical to those detailed for the original sampling sites. Surface plankton sampling was conducted using a conventional 12-inch surface net equipped with 500-micron netting.

Since the sampling procedure varied as the program progressed, the schedule of site visitations and concomitant efforts are indicated in Table 1, and all sampling sites are indicated in Figure 1.

Simultaneous with biological sampling at each site, temperature, salinity, dissolved oxygen, pH, and transparency were determined. Additionally, the tide stage, prevailing winds, and general weather conditions were recorded. Critical parameters were ascertained as follows:

(1) Temperature: Surface and/or bottom temperatures were determined with either standard mercury-filled, hand-held thermometers or with a Beckman Model RS5-3 salinometer. All readings were recorded to the nearest 0.1°C.

(2) Salinity: Salinity was determined by using refractometers (A O Instrument Company, Models 10402 and 10419) or a Beckman Model RS5-3 portable electrodeless induction salinometer. The refractometers were read to the nearest part per thousand (ppt) while the salinometer was read to the nearest 0.1 ppt.

(3) Oxygen: Dissolved oxygen concentrations were determined by using either a portable oxygen meter (Yellow Springs Instrument Co., Model 54), or the Alsterberg (Azide) modification of the Winkler titration technique.

(4) pH: Water samples were collected at the site and level of each biological sampling effort with standard 1-liter Kemmerer bottles. The samples were subsequently iced or frozen and transported to the laboratory where pH was determined with a Corning Model 10 expanded scale pH meter.

(5) Transparency: Water transparency was estimated by lowering a standard 30-cm diameter, white Secchi disc to its extinction point. The results were recorded to the nearest half foot.

Insofar as bottom type can be properly regarded as a physical parameter of import in determining the distribution of the sessile stages of scyphomedusae, a series of experiments was conducted to ascertain the ability of sessile stages of noxious coelenterates to develop on substrata characteristic of Mississippi Sound bottoms.

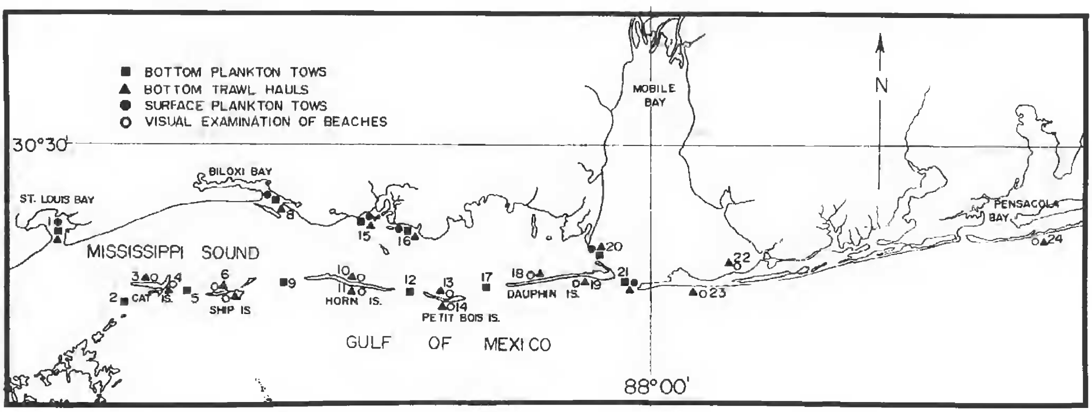

Figure 1. Coelenterate sampling sites in the northern Gulf of Mexico, April 1971–June 1973.

TABLE 1.

Schedule of site visitations and concomitant sampling efforts during the course of the coelenterate sampling program in Mississippi Sound and adjacent waters, April 1971–June 1973.

1 = 30-minute bottom trawl haul
2 = 60-minute surface plankton haul
3 = 60-minute bottom plankton haul
4 = 1-mile visual survey of beach adjacent to trawl site
– = no sample for month

	Station																							
Year/Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1971																								
April	–	–	1,4	1,4	1,3	1,4	1,4	–	1,3	1,4	1,4	1,3	1,4	1,4	–	–	–	–	–	–	–	–	–	–
May	–	–	1,4	1,4	1,3	1,4	1,4	–	1,3	1,4	1,4	1,3	1,4	–	–	–	–	–	–	–	–	–	–	–
June	–	–	–	–	1,3	1,4	1,4	–	1,3	1,4	–	1,3	1,4	1,4	–	–	–	–	–	–	–	–	–	–
July	–	–	1,4	1,4	1,3	1,4	1,4	–	1,3	1,4	1,4	1,3	1,4	1,4	–	–	–	–	–	–	–	–	–	–
August	1,2,3	–	1,4	1,4	1,3	1,4	1,4	–	1,3	1,4	1,4	1,3	1,4	1,4	–	1,2,3	1,3	–	–	–	–	–	–	–
September	1,2,3	1,3	1,4	1,4	1,3	1,4	1,4	1,2,3	1,3	1,4	1,4	1,3	1,4	1,4	1,2,3	1,2,3	1,3	–	1,4	–	1,2,3	–	–	–
October	1,2,3	1,3	1,4	1,4	1,3	1,4	1,4	1,2,3	1,3	1,4	1,4	1,3	1,4	1,4	1,2,3	1,2,3	–	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
November	1,2,3	1,3	–	1,4	1,3	1,4	1,4	1,2,3	1,3	1,4	1,4	1,3	1,4	1,4	1,2,3	–	1,3	–	1,4	–	1,2,3	1,4	1,4	1,4
December	1,2,3	3	1,4	1,4	1,3	1,4	1,4	1,2,3	1,3	1,4	1,4	1,3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
1972																								
January	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	–	–	–	–	1,4
February	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
March	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
April	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	–	1,4	1,4	1,4
May	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	–
June	–	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
July	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
August	1,2,3	1,3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
September	–	3	1,4	1,4	1,3	1,4	1,4	1,2,3	1,3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
October	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
November	–	1,3	1,4	1,4	3	1,4	1,4	–	3	1,4	–	–	–	–	–	–	–	–	–	–	–	–	–	–
December	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,3	1,4	1,4	3	1,4	–	1,2,3	1,2,3	3	–	1,4	–	–	–	–	–
1973																								
January	–	3	1,4	1,4	3	1,4	1,4	–	3	1,4	1,4	3	1,4	1,4	–	–	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	–
February	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4
March	–	–	1,4	1,4	3	1,4	1,4	–	3	1,4	1,4	3	1,4	1,4	–	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	–	–
April	–	3	1,4	1,4	3	1,4	1,4	–	3	1,4	1,4	3	1,4	1,4	–	–	3	1,4	1,4	–	–	–	1,4	–
May	–	3	1,4	1,4	3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	–	–	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	–
June	1,2,3	3	1,4	1,4	1,3	1,4	1,4	1,2,3	3	1,4	1,4	3	1,4	1,4	1,2,3	1,2,3	3	1,4	1,4	1,2,3	1,2,3	1,4	1,4	1,4

Muds from Mississippi Sound were forced through sieves of three mesh sizes: 1 mm, 500 μ and 250 μ. Subsamples of the resulting four fractions were placed in glass aquaria containing artificial seawater. Planulae or detached polyps of the following species: *Cyanea capillata versicolor, Chrysaora quinquecirrha,* and *Aurelia aurita* were placed in small, all glass aquaria.

Developmental responses of each species maintained on the various substrata were observed and recorded for periods of time up to 2 months. Long-term developmental norms for the three species were determined by maintaining specimens for up to 1 year when attached to oyster shells or to glass slides.

Since experimentation disclosed the inability of scyphozoan polyps to develop on the silt-like material characteristic of Mississippi bottoms, and field investigations had failed to demonstrate the presence of these sessile forms on existent reefs within the Sound, fouling plates were introduced and artificial reefs were constructed in the areas of higher salinity waters near each of several of the Gulf passes.

Cleaned oyster shells were strung at 1-foot intervals on 80-lb test monofilament lines. Small anchors were attached to the lower ends of the strings and the entire assemblies were held in a near vertical position through the action of surface floats. Additional shell strings were affixed to aids to navigation or other appropriate structures in the area. Such devices were employed in this study as early as June 1971. However, the maintenance of fouling plates in the island passes proved impracticable because of losses resulting from the high incidence of commercial trawling, destruction of navigation aids by barges and other such unwieldy vessels, or removal or destruction by fishermen or pleasure boaters.

Since no polyps were observed on the fouling plates and because of the futility of maintaining them, small reefs were built at stations 4, 9 and 12 in April 1972. Each reef consisted of 125 cubic feet of cleansed oyster valves. Samples were taken by tonging at as close to monthly intervals as weather permitted and were meticulously examined in the laboratory for scyphopolyps.

Concurrent with field and laboratory investigations during the study period, regular contact was maintained with the eight general hospitals in the Mississippi coastal area, and with 14 private physicians in an attempt to monitor jellyfish-inflicted injuries serious enough to warrant professional medical attention.

RESULTS

Seven cnidarian species, represented by 5,704 specimens, were collected in the course of trawling operations during the study period. An additional 5,696 specimens were collected from the sea wrack along the islands adjacent to the trawling sites.

The seven species identified, in order of descending abundance, were:

(1) *Stomolophus meleagris* L. Agassiz 1862
(2) *Crysaora quinquecirrha* (Desor 1848)
(3) *Physalia physalis* (L)
(4) *Pelagia noctiluca* Forskål 1775
(5) *Aurelia aurita* (L)
(6) *Chiropsalmus quadrumanus* (Müller 1859)
(7) *Rhopilema verrillii* (Fewkes 1887)

An appropriate systematic account of the above species is given in Table 2. Individual records of the more abundant species are presented in Tables 3–6, inclusive.

INDIVIDUAL ACCOUNTS OF COLLECTED SPECIES

Stomolophus meleagris, almost always present in Mississippi Sound in varying numbers, was most abundant during midwinter. Specimens were collected which ranged in size from 3.0 to 380 mm bell diameter, suggesting that a few of these medusae may survive for longer than 1 year. *Stomolophus,* although not particularly virulent, is occasionally so abundant that is causes difficulties for commercial trawling operations. The records of *S. meleagris* collections are presented in Table 3.

Chrysaora quinquecirrha, tolerant of wide variations in salinity, is apparently able to survive only during the warmer months along the northern Gulf of Mexico. An irritating stinger, this medusa is most abundant during July and August, but may be collected from March through November.

Although *Crysaora* is a bane to swimmers and fishermen, there were no authenticated accounts of medical treatment for injuries caused by it in the study area. Records of *C. quinquecirrha* collections are shown in Table 4.

Aurelia aurita occurs along the northern Gulf coast during the colder months of the year as revealed in Table 5. Because of its seasonal distribution it is rarely encountered by swimmers and, since *Aurelia* is not particularly virulent, it causes no serious problems for commercial fishermen along the coast.

Chiropsalmus quadrumanus, the most venomous stinger occurring along the northern coast of the Gulf of Mexico,

TABLE 2.

Systematic account of the macrocoelenterates collected in Mississippi Sound and adjacent waters, April 1971–June 1973.

Phylum: Cnidaria
  Class: Hydrozoa
    Order: Siphonophora
      Sub-Order: Cystonectae
        Family: Physaliidae
          Physalia physalis (L)
  Class: Scyphozoa
    Order: Cubomedusae
      Family: Carybdeidae
          Chiropsalmus quadrumanus (Müller 1859)
    Order: Semaeostomeae
      Family: Pelagiidae
          Pelagia noctiluca Forskål 1775
          Chrysaora quinquecirrha (Desor 1848)
      Family: Ulmaridae
          Aurelia aurita (L)
    Order: Rhizostomeae
      Family: Rhizostomidae
          Rhopilema verrillii (Fewkes 1887)
      Family: Stomolophidae
          Stomolophus meleagris L. Agassiz 1862

TABLE 3.

Trawl collection record for *Stomolophus meleagris* in Mississippi Sound and adjacent waters, April 1971–June 1973.

(Parenthetic numbers indicate stranded specimens per mile of beach adjacent to trawl site.)

	Station																							
Year/Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1971																								
April					1	1(3)	3(1)				10(1)			3										
May						(2)					1(1)													
June																								
July																								
August																								
September		1		1							21		1											
October																			(1)					
November																			1					
December						(1)			(1)		1		(2)						(5)				(3)	
1972																								
January				(18)		(44)				1(1)				1				(1)						
February																								
March																								
April																								
May																								
June								92																
July																								
August																1					1			
September																								
October																		(1)						
November			(2)	(1)			(4)			(4)														
December						(40)	9(112)		33	1(1097)	16													
1973																								
January				1		2(458)	2(409)				7			2				3				(1)	(1)	
February	1		(1)			(132)				(488)	1(584)		(5)									(1)		
March						(3)	(46)			(7)	(9)			(11)										
April			(1)	5		1(24)	(118)			(167)	(3)		(2)	(9)					1				(2)	
May										(5)	(4)													
June																								

TABLE 4.

Trawl collection record for *Chrysaora quinquecirrha* in Mississippi Sound and adjacent waters, April 1971–June 1973.

(Parenthetic numbers indicate stranded specimens per mile of beach adjacent to trawl site.)

Year/Month	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1971																								
April																								
May							1		73	7	19													
June					19	5						3												
July			1			1								83										
August	55			(16)	8		5(1)		11		135(6)	50		162		4								
September		2	1	7	4	(32)	4		2		263	115	2	17					62		1			
October		1	7		54		4	2	276				3	1		2	3		3					9
November								1											3				6	
December																								
1972																								
January																								
February																								
March																								
April																		3						
May						(4)				4	2(2)			90			7				6	4		
June							59	46		1	94		(2)	(1)		14		(1)	1		24	(1)	30(1)	
July	1					1	2				6				1	35		1		2	35	6	13(1)	10
August		40	5		(1)	1	39	146			3		5(25)		46	109	2	4	383	13		8	65(1)	216
September				1	1	12	46	1		3	1			8				7	1	9	2		5(1)	318
October						2	16				13								2					
November							1						2											
December																								
1973																								
January																								
February																								
March																								
April																								
May				1			1				11			49							1			
June				7	5	3	18			1			4	3					1		1		11	

TABLE 5.

Trawl collection record for *Aurelia aurita* in Mississippi Sound and adjacent waters, April 1971–June 1973.

(Parenthetic numbers indicate stranded specimens per mile of beach adjacent to trawl site.

	Station																							
Year/Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1971																								
April																								
May																								
June																								
July																								
August																								
September																	10							
October		6	(31)	3(15)	19		2		18(1)		1(1)	1	(6)	(7)			2						(1)	42(12)
November		14		12(5)		(37)	5		20	(1)		31	11	21(4)					108				1	4
December			(3)	3	3	2(14)	1							1									4	
1972																								
January																								
February																								
March																								
April																								
May																								
June																								
July																								
August																								
September											1							2			2			
October				1		(6)					3			1(1)					1					3
November																								
December							(1)		1		4		1											
1973																								
January																			3				1	
February																								
March																								
April											(1)													
May																								
June																								

TABLE 6.

Trawl collection record for *Chiropsalmus quadrumanus* in Mississippi Sound and adjacent waters, April 1971–June 1973.

Year/Month	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1971																								
April																								
May																								
June																								
July																								
August					3																			
September			1	3					2		12	12	3	19			1							
October		4		4	32		13		84			1		1										
November									2															
December																								
1972																								
January																								
February																								
March																								
April																								
May																								
June																								
July																								
August		6	1				1				1													
September				30		1	26			3	13		1				1				1	1		
October			3	1		27	16				1													
November										1														
December																								
1973																								
January																								
February																								
March																								
April																								
May																								
June																								

was collected only during the late summer and fall months. Apparently, having an affinity for deeper, high-salinity waters, it was only rarely encountered along mainland shores. The frequency of occurrence of this animal along the barrier islands, coupled with the almost complete transparency of these medusae, suggests that *C. quadrumanus* could pose a hazard to unwary swimmers. Collection data concerning this organism are defined in Table 6.

Physalia physalis, the Portuguese man-of-war, an open Gulf form, is swept onto the barrier island beaches under fortuitous combinations of wind and current. During May 1971, 102 specimens were collected at stations 4, 6 and 11; while stations 7, 19, and 23 yielded 1426 specimens during December of the same year.

During March, April and July 1972, only 59 man-of-war were found and these occurred at stations 10, 13, 14 and 23.

In 1973 *Physalia* was observed in March and 17 specimens were collected on the beaches adjacent to station 10. All specimens of *Physalia* collected were removed from the beaches adjacent to the corresponding sampling stations (Figure 1).

Intact specimens of *Physalia* do not reach the mainland beaches because their tentacles are abraded as the animals drift through the shallow waters of Mississippi Sound.

Pelagia noctiluca, the mauve stinger, is strictly an oceanic form which occurs in Mississippi Sound only erratically. When long-term incursions of high-salinity waters into Mississippi Sound occurred, these medusae were abundant. *Pelagia* are incapable of prolonged survival within the estuary and are usually moribund when encountered there.

During September 1971, one mauve stinger was collected by trawl at station 11, and a second specimen at station 17. Station 24 yielded 100 specimens to a single 30-minute trawl haul during November 1972.

A swarm of *Pelagia* occurred in the northern Gulf of Mexico in June 1973, with standard trawling yielding a total of 1123 specimens from stations 3, 7 and 11. The presence of 82 specimens in a Clarke-Bumpus bottom plankton sample taken at station 12 (June 1973) demonstrated the local high density.

Rhopilema verrillii is rare along the northern Gulf coast. This organism is of interest in that, even though innocuous, it probably achieves the greatest size of any medusae catalogued from this area. Only eight viable specimens were collected during this study. During April 1971, trawling yielded one specimen from station 11 and four from station 14. Single specimens were collected July 1971 and December 1971, from stations 13 and 12, respectively. The other live specimen was collected at station 9 in December 1972.

During April 1971, visual surveys of beaches adjacent to stations 10, 13 and 14 disclosed one, two and four stranded specimens of *Rhopilema*, respectively. A single beached specimen was taken near station 11 in May 1971.

In January 1973, single specimens of stranded *Rhopilema* were recovered from stations 4 and 6, and two from near station 7. A single specimen of *Rhopilema* was found beached adjacent to station 14 in March 1973.

PLANKTON ANALYSIS

Concurrent with trawling operations, plankton samples were regularly collected within mainland bay areas and in the passes between the barrier islands. Microscopic examination of 224 bottom plankton samples and 102 surface plankton samples failed to disclose ephyrae or early postephyrae of any coelenterate species. The absence of such larval forms indicates that the cnidarian fauna of Mississippi Sound is recruited from an offshore population. The schedule followed in securing plankton samples is shown in Table 1.

HYDROLOGICAL PARAMETERS

Extreme variations in physical parameters were encountered owing to the far-flung nature of the sampling sites and to the inherently fluctuant character of shallow sounds.

Temperatures in the study area followed a fairly predictable seasonal cycle averaging about 12°C during the winter and reaching a summer average of about 30°C. Temperature extremes of 8.9°C and 32.6°C were observed during the study period.

Salinities in the study area ranged from fresh in the upper bay areas to oceanic in the island passes during intrusions of Gulf water.

There was a demonstrable suppression of salinity in the western Sound during the spring and summer of 1973 because of extensive flooding and the concomitant opening of the Bonnet Carré Spillway in the Mississippi River. Salinity extremes of 0.0 ppt and 37.0 ppt were encountered during the study period.

Dissolved oxygen concentrations and pH values generally fell within a range presumed biologically acceptable. All critical hydrographic data are shown in Figure 2.

DEVELOPMENTAL STUDIES OF SCYPHOZOA FROM THE NORTHERN GULF OF MEXICO

Planulae stripped from *Rhopilema verrillii* and *Aurelia aurita* readily produced ephyrae under laboratory conditions. Planulae of *Chrysaora quinquecirrha* were not obtainable either by stripping or by crowding adult medusae into small volumes of seawater, although such efforts were repeated throughout the season. However, with the discovery of polyps and pedal cysts of *Chrysaora* along the barrier islands, partial developmental studies for the species were completed. Experimental studies were continued with polyps of *Cyanea capillata versicolor* collected during the winters of 1968 and 1969. The developmental histories of these four species are presented in Table 7.

A series of substrate preference studies showed that none of the above species were capable of developing normally on particles smaller than 250 μ. Although both *Chrysaora* and *Aurelia* responded to the silt substrate by secreting a broad, adhesive base, neither survived longer than 8 weeks.

Conversely, none of the scyphozoan species utilized the

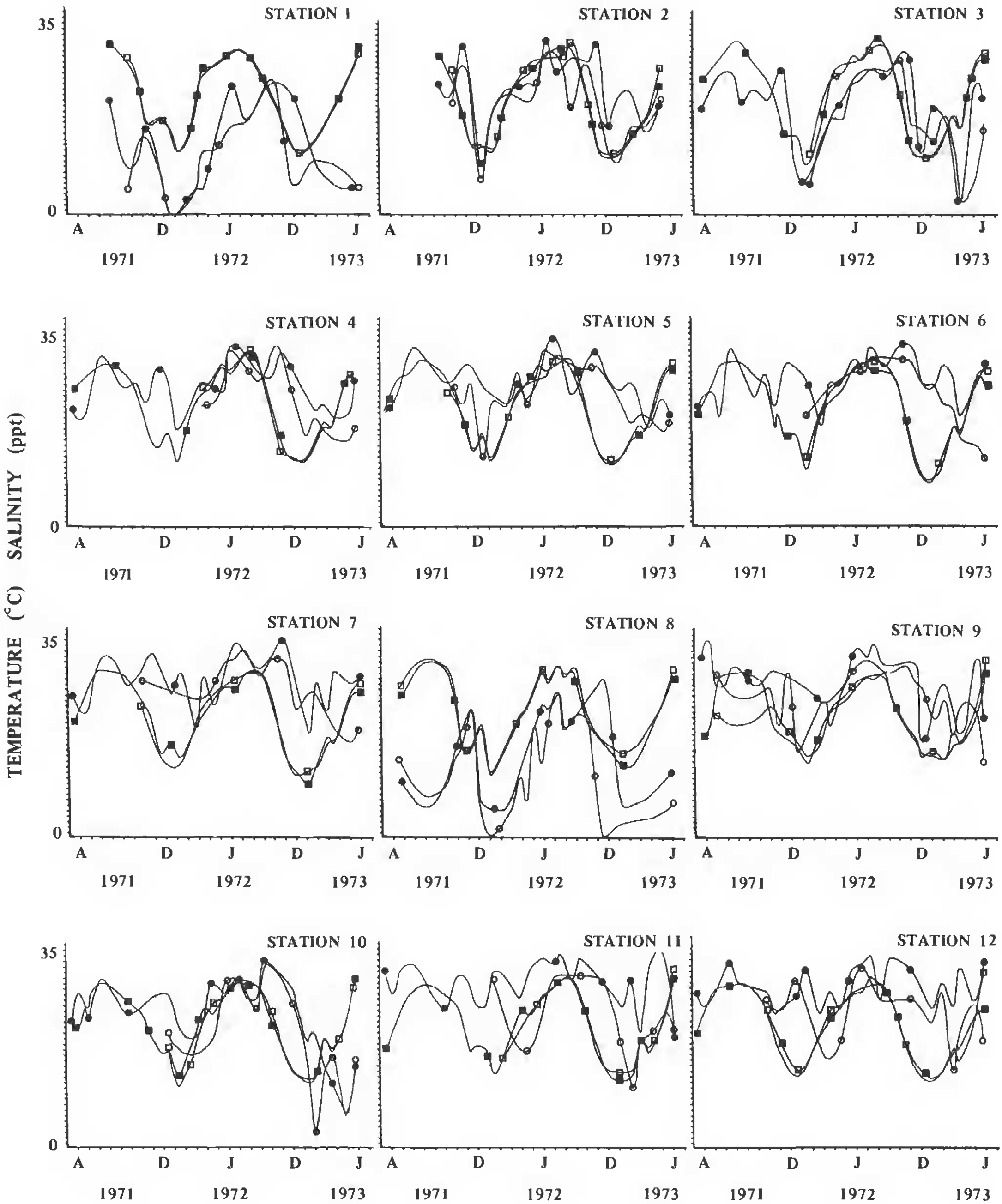

Figure 2. Surface and bottom temperatures and salinities associated with coelenterate sampling sites along northern Gulf of Mexico, April 1971–June 1973. ○ = surface salinity, ● = bottom salinity, □ = surface temperature, ■ = bottom temperature. (Page 1 of 2)

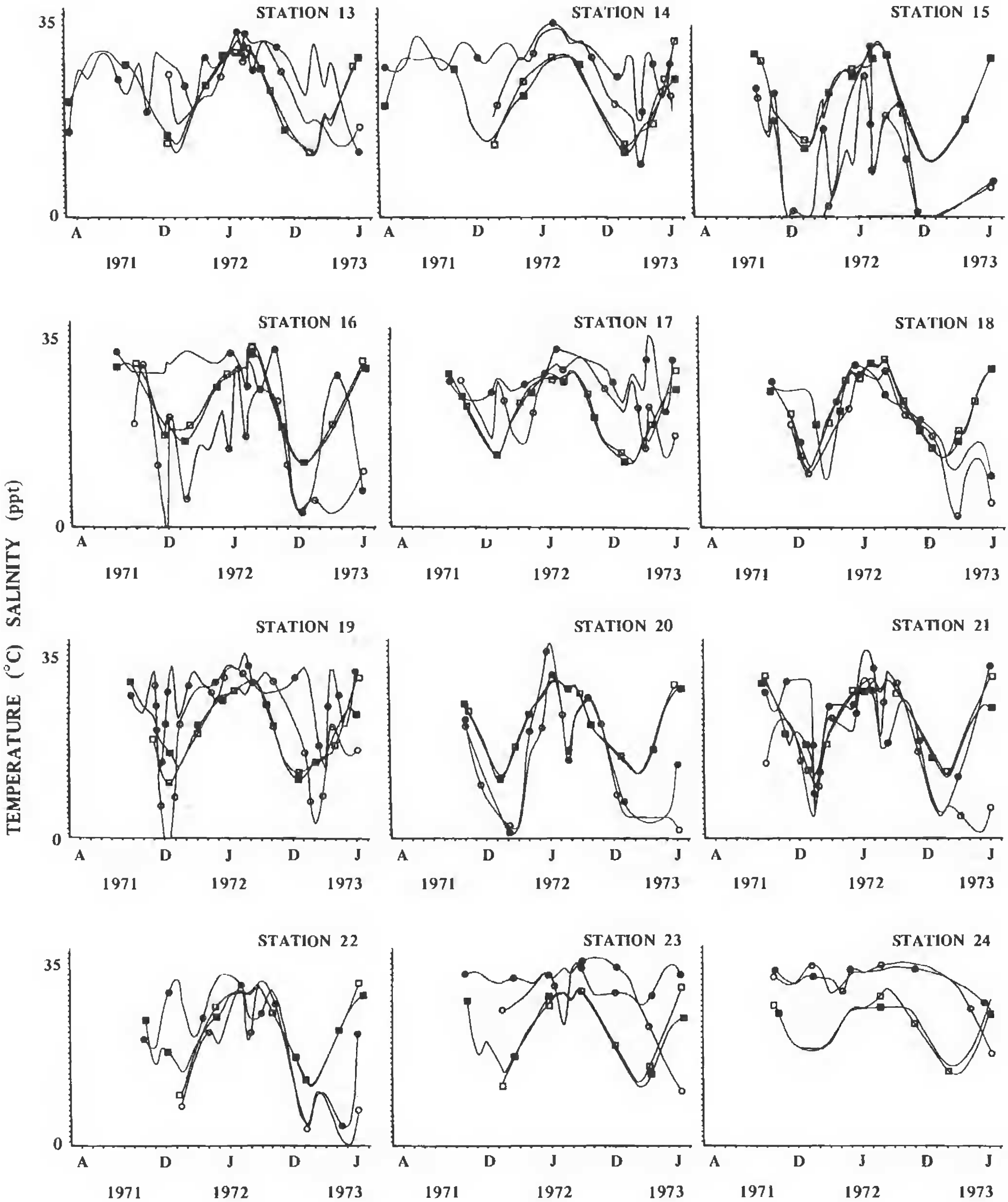

Figure 2. Surface and bottom temperatures and salinities associated with coelenterate sampling sites along northern Gulf of Mexico, April 1971–June 1973. ○ = surface salinity, ● = bottom salinity, □ = surface temperature, ■ = bottom temperature. (Page 2 of 2)

TABLE 7.

Typical developmental patterns of four species of northern Gulf of Mexico scyphozoa.

Species	Temperature	Salinity	Typical Developmental Pattern	Time
C. capillata	13°C	20 ppt	planula – cyst – polyp – podocyst – strobila – ephyrae	9–14 mo.
R. verrillii	13°C	35 ppt	planula – polyp – died	6 days
R. verrillii	18°C	35 ppt	planula – polyp – strobila – ephyrae and/or podocysts	90 days
R. verrillii	22°C	35 ppt	planula – polyp – strobila – ephyrae and/or podocysts	90 days
A. aurita	22°C	35 ppt	planula – polyp – strobila – ephyrae	90–120 days
C. quinquecirrha	22°C	30 ppt	polyp or podocyst – strobila – ephyrae	8 days

fouling plates or artificial reefs provided in the island passes. Enigmatically, cysts and polyps of *Chrysaora* regularly occur in the deeper concavities of mollusc valves found in the swash or in the surf along the Gulf side of the barrier islands. These podocysts are typically found in the valves of such high-salinity forms as *Anadara* sp., *Busycon* sp., *Oliva* sp., and *Arca* sp., suggesting that the Gulf race of *Chrysaora* is probably neritic in habit.

MEDICAL INQUIRIES

Of eight general hospitals and 14 practicing physicians along the coast with whom frequent communication was made, none reported treatment of patients with jellyfish-inflicted wounds. Presumably, these data would be accurate since many of the cooperating physicians proffered accounts of treating wounds inflicted by salt-water catfish and rays.

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